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Multi-Echelon Distributed Army Leaders' Information Support Training (MEDALIST) II: Prototype Development and Recommendations for Future Training

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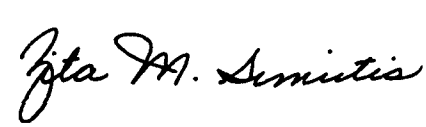

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14. ABSTRACT *(Maximum 200 words)*: In the *Multi-Echelon Distributed Army Leaders' Information Support Training* (*MEDALIST*) project, researchers examined communication requirements essential to the conduct of battle command in the emerging operational environment and designed a flexible, scalable approach for training those and related tasks in a distributed training environment. The MEDALIST approach comprises a structure of communication drills with varying difficulty levels and scenario settings, targeted training audiences, a distributed performance coaching model, and specifications for a PC-based system that supports delivery of the training. This follow-on to the MEDALIST effort examined the potential to apply the MEDALIST approach to the training of information support activities in the emerging Future Force and Stryker Brigade Combat Team environments. Project objectives included analyzing and modifying the MEDALIST approach to address performance conditions and requirements unique to Future Force and Stryker environments. This report describes the background, objectives, activities, products, and conclusions of the research effort. Intended for Future Force and Stryker Brigade Combat Team training and training system designers, it offers recommendations in the areas of training systems, training processes, and MEDALIST utilization.

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MULTI-ECHELON DISTRIBUTED ARMY LEADERS' INFORMATION SUPPORT TRAINING (MEDALIST) II: PROTOTYPE DEVELOPMENT AND RECOMMENDATIONS FOR FUTURE TRAINING

EXECUTIVE SUMMARY

Research Requirement:

The U.S. Army, with its rapid introduction of new operational and organizational concepts, weapons and communications systems, and training methodologies, has an urgent need to identify critical performance requirements and effective training methods for both the current and Future Force timeframes. In its Science and Technology Objective IV.SP.2002.02, "*Methods and Measures of Commander-Centric Training*," the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is developing a variety of new training tools, design and development methods, and instructional options to enhance the Army's ability to produce the capable leaders required for future missions.

In recent work (*Multi-Echelon Distributed Army Leaders' Information Support Training [MEDALIST];* Graves et al., 2004), ARI at Fort Knox, Kentucky, identified communication requirements essential to the conduct of battle command in the emerging operational environment and designed a flexible, scalable approach for training those tasks in a distributed manner. The MEDALIST approach comprises a notional structure of communication drills with varying difficulty levels and scenario settings, targeted training audiences, embedded coaching opportunities, and specifications for a personal computer-(PC) based training system.

This follow-on effort examined the potential to apply the MEDALIST approach and methods to the training of information support activities in the emerging Future Force and Stryker Brigade Combat Team (SBCT) environments, with an emphasis on exploring the use of distributed and frequent coaching.

Procedure:

Analysis of the Future Force and SBCT performance requirements led to the conclusion that the emerging operational and training environments will present significant force development and training challenges. The need for decentralized command and control (C2) for distributed planning and replanning, and for adaptive leaders and staffs, exists already and will continue to be a challenge. Training that is flexible, scalable, and adaptable will remain the goal. As a result, the basic MEDALIST approach was essentially unchanged in this follow-on research.

Analysis of the project training system—the MEDALIST Prototype System (MPS)—and examination of earlier pilot test results resulted in a modification to incorporate One Semi-automated Forces (OneSAF) Testbed Baseline (OTB) in the design of some of the drills. Using OTB would, in theory, simplify the generation of the reports that cued performance events and

enable more flexible training. The structure of the training support package (TSP) was also refined.

Five prototype drills were developed to exemplify the revised approach and the MPS. Drills designed for the SBCT and Future Force environments were pilot tested, both to demonstrate the approach and to obtain more detailed performance requirements data. The pilot tests also resulted in the identification of recommendations in the areas of training and training system design for the Future Force environment.

Findings:

Observations and feedback from pilot exercises led to the revision and finalization of the prototype drills developed during the project. Pilot findings also supported the development of recommendations related to the design and utilization of future training and training systems.

Overall, participants characterized the approach as either currently or potentially valuable and effective. Specific areas in which participants noted benefits included the following: delivering concise communications, responding to fragmentary orders, disseminating information, reporting (in general), prioritizing information, conducting crosstalk, working with shared tactical products, and involving subordinate commanders in the planning process. Furthermore, participant comments indicated that the training would be a good use of time, especially if it is supported by a system that yields more latitude in tactical decision-making.

Utilization and Dissemination of Findings:

Current analyses of the Army's transformation indicate that distributed training will come to represent a standard method of Army training. Factors driving this condition include the increased dispersion of U.S. forces across the globe and the development of embedded, desktop, and personal digital assistant-based training capabilities. Under these conditions, the requirement for distributed training *will* surface, resulting in a requirement for distributed coaching. Additionally, as Future Combat System of Systems developers produce new operational systems, the emerging performance requirements will include basic human performance skills, including communication. These skills should be trained as they will occur in the context of Unit of Action (UA) task performance, as well as in isolation, when more remedial training is needed.

The MEDALIST approach offers considerable utility when paired with the conditions and requirements noted above. In addition to providing techniques for distributed coaching, a method for focusing on communication, and a framework of progressively applied practical exercises, the approach also supports the provision of that training in a deliberate, efficient manner. As Army training developers begin to devise methods for conducting distributed training on emerging performance requirements, the MEDALIST approach provides the foundation of concepts and content on which they should build.

MULTI-ECHELON DISTRIBUTED ARMY LEADERS' INFORMATION SUPPORT TRAINING (MEDALIST) II: PROTOTYPE DEVELOPMENT AND RECOMMENDATIONS FOR FUTURE TRAINING

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After a two-week exercise with the entire squadron in the field, Lieutenant Colonel (LTC[1]) Alexis was concerned that he and his troop commanders still were not performing as the streamlined team he had hoped to build prior to their scheduled deployment. With elements of the squadron widely dispersed across the training area, the team was unable to communicate requirements quickly enough to complete even two full missions a day. As the Cavalry Squadron Commander, he had to find a way to work collectively with just his commanders on team communication before they got roped into the details of their deployment, scheduled to occur in just three months.

The next day, LTC Alexis sat down at his computer and searched the Army's training repository. Keying his search on "communication training," he discovered a program that looked like what he needed. The program provided intranet-supported, personal computer (PC) -based drills that were designed to train leader teams in the communication component of battle command. The program simulated Force XXI Battle Command for Brigade and Below (FBCB2) type capabilities and offered various tactical scenarios for different types and levels of combat units. He had his executive officer (XO) review the drills available, contact the program's point of contact to arrange the assistance of an expert coach who would support the training from the coach's home station, and download the supporting training materials and software. He scheduled the training for four hours each Friday morning over the next three weeks.

Four months later, deployed in theater and awaiting their movement to take over a security sector, LTC Alexis contemplated his new A Troop commander. There was a marked difference in the communication between his experienced and trained commanders and the "new guy." The drills would help, but would they be able to perform the drills out here in the desert? Yes. The same training he had executed at his home station, with the same coach, was available through the Battle Command network and platform training systems, and was just as close as it had been back in Texas. A few more drills and not only was the new commander up to speed, but the entire team had refined their skills further to make combat leadership even more responsive and accurate.

It all paid off a few weeks later. During routine security activities, a heavily armed paramilitary force lunged across the border into LTC Alexis's sector. Expecting to get in, strike quickly, and get out before the scattered U.S. forces could react, they miscalculated badly. Alexis's squadron was on the move, updating their situational awareness and planning and coordinating their actions from the far corners of the sector. Faster than anyone had a right to expect, the troop commanders understood the situation and what their commander expected of them, and were able to translate rapid planning directly into action. Some hard work later, the enemy force was captured and destroyed with little friendly loss. Only a tightly integrated team of commanders skilled in communicating with each other could have pulled this off, Alexis later reflected.

[1] A list of all acronyms used in this report is included in Appendix A.

Introduction

To those dedicated to ensuring unparalleled mission performance and force protection for future U.S. Army forces, the above imaginary vignette illustrates an exciting capability. No longer just a vision, the potential for highly synchronized distributed operations is currently being fulfilled through the Army's demonstrated commitment to assimilating emerging technology and innovative ideas and processes into all areas of force development and training. The assimilation is underway with the construction of Future Force organizations, beginning with the Unit of Action (UA)[2], and the design and development of the Future Combat System of Systems (FCS). Linked to the developments in these areas are the concurrent efforts to identify critical performance requirements and effective training methods for both the current and Future Force timeframes.

As developments in these areas proceed, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is contributing in the areas of leader development and training. In its Science and Technology Objective IV.SP.2002.02, "*Methods and Measures of Commander-Centric Training*," ARI is developing a variety of new training methods and guidance to enhance the Army's ability to produce the capable leaders required for future missions. Distributed training, representing a more viable and effective training option in the future, has been the focus of recent ARI research, which has included the design of an approach for conducting distributed training on the communication requirements essential to battle command in the emerging operational environment. The hallmark of this approach, which is called Multi-Echelon Distributed Army Leaders' Information Support Training (MEDALIST; Graves et al., 2004), emphasizes the use of active performance coaching to maximize skill improvement *during* training. To accomplish this, the MEDALIST approach provides a notional structure of mutually supporting drills with embedded coaching opportunities made possible by PC-based training delivery system specifications that reflect future embedded training system capabilities.

The subject of this report is ARI's continuing effort to develop and highlight the potential of the three key elements of the MEDALIST approach—distributed training, performance coaching, and training system capabilities—to enhance Army training. The products and findings discussed in this report demonstrate the MEDALIST approach as applied in the context of the FCS UA and Stryker Brigade Combat Team (SBCT) environments. The report summarizes the MEDALIST approach and offers recommendations for the development of future training.

Background

The MEDALIST approach (described in Graves et al., 2004) addresses two significant training challenges posed by the contemporary operating environment. One challenge is to understand the requirements for communication and information support that are occurring under increasingly dispersed operating conditions. Effective communication underlies the performance of all Army collective tasks, and will continue to be important as the strategies of force projection and information dominance continue to expand. A second challenge is to train those

[2] Also referred to as a Brigade Combat Team.

requirements in a way that incorporates expert coaching, despite the possible scarcity of expert trainers and geographical dispersion of units and trainers.

The MEDALIST performance requirements for communication and information support are captured and conveyed in a foundational training objective (shown in Appendix B). The overall objective statement is:

> *"Commanders communicate to exert and facilitate decentralized battle command and control (C2) in a dispersed operating environment."*

This statement identifies communication as the focus of the training, while setting the general context for that focus. The objective also contains specifications of conditions, standards (i.e., key outcomes), communication tasks and task steps, and coaching points. Two of these elements deserve special attention: coaching points and standards. Standards are used to identify when coaching is required. Coaching points represent the primary focus of MEDALIST training and coaching and provide cues that guide the provision of performance feedback.

The MEDALIST objective shown in Appendix B presents communication performance requirements at a mid-level of complexity. The requirements are procedural, and are neither so basic as to assume that the training participant knows nothing about communication, nor so complex as to demand advanced mastery of communication techniques. The requirement is not meant to capture all aspects of communication and information support, but is sufficient to support the development of a training approach.

The approach developed to train the noted objective meets the second challenge—to support efficient training under simulated or real dispersed conditions—by incorporating five key features: focus, efficiency, flexibility, scalability, and adaptability.[3]

Focus refers to those design elements that keep the training targeted on the objective and is accomplished by applying principles of structured training. Structured training is the intentional design of training events so that participants perform tasks in an anticipated sequence, receive frequent and specific performance feedback, and accomplish training objectives (Campbell, Quinkert, & Burnside, 2000). Structured training, implemented through the use of training support packages (TSPs; Department of the Army [DA], 1999) and a training system that provides performance cues and enables and tracks communication activities, is a particularly effective means of supporting training that emphasizes active performance feedback and coaching.

Related to focus, *efficiency* entails fast and accurate skill acquisition that is resistant to decay over time. In the MEDALIST approach, efficiency is supported by the use of the deliberate practice method, which integrates the forced repetition of task performance with the provision of cues and performance coaching until criterion performance has been achieved (Ericsson, Krampe, & Tesch-Römer, 1993). This intentional and disciplined method of training is executed under drill-like conditions and removes task performance from the overwhelming context of the larger mission or game. This isolation of task performance translates into an

[3] The discussion of the MEDALIST approach features is adapted from Graves et al., 2004.

emphasis on performance technique over performance outcome, which is often influenced by factors other than strict technique and may divert the intended focus of the training. The deliberate practice method of training has been used over the years to train motor skills as well as cognitive tasks. Examples in which the deliberate practice method has been used in the military setting to train cognitive skills include the U.S. Army Training and Doctrine Command (TRADOC) *Adaptive Thinking Leaders' Guide* and the ARI *Think Like a Commander* training program (Shadrick & Lussier, 2002).

In the MEDALIST approach, deliberate practice and coaching are supported through the use of a coaching agreement, which is established jointly by the senior commander and the primary trainer to ensure a collaborative coaching partnership. The agreement states the audience's developmental goals, the trainer's corresponding coaching goals, expectations for how and who the trainer will coach and how the audience will respond to that coaching, and provisions for pausing the drill for coaching and repeating scenario events as required to achieve desired performance.

The three remaining features—flexibility, scalability, and adaptability—are interrelated, as demonstrated in Figure 1.

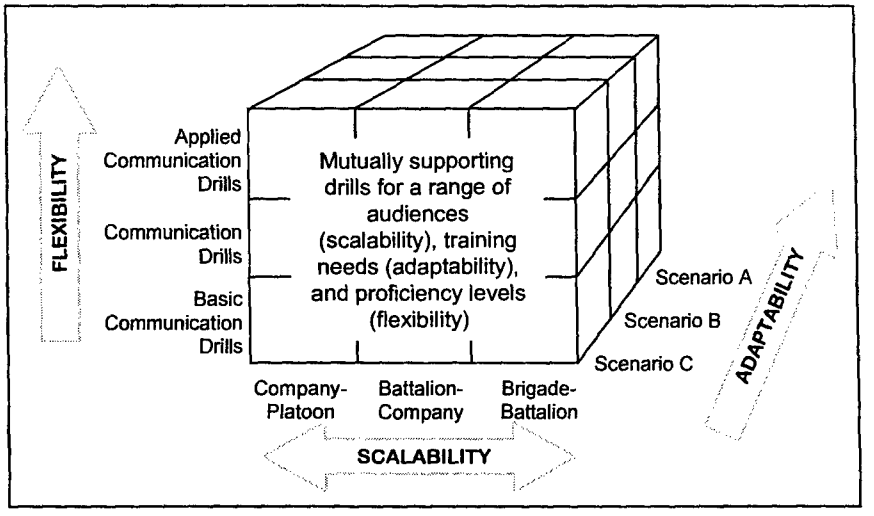

Figure 1. Structure of the Multi-Echelon Distributed Army Leaders' Information Support Training approach.

The *flexibility* of the MEDALIST approach resides in its capacity to support a range of communication-oriented training objectives. The framework of the approach prescribes three levels of training—Basic Communication Drills, Communication Drills, and Applied Communication Drills—providing a staged approach to training the different aspects of communication in battle command.

Basic Communication Drills, representing Level 1 training, provide process-oriented, crawl-level (i.e., part-task) training on the base MEDALIST training objective (i.e., basic communication skills). This training, designed for single member or small group audiences, would be developed in drill sets, with each set consisting of 6 to 8 short drills that last

approximately 10 minutes each. All drills in a set would be framed in the context of a single mission segment. Individual drills would present different tactical events, but use the same mission and initial tactical situation to reduce both development time and participant preparation time requirements. The drills in a set would be executed consecutively as a single training event and provide a unique opportunity for an audience to approach automaticity, approximating "over-learning," on skills that need to be executed as a matter of course. Used as intended, these drills would prepare an audience for training with an expanded focus.

Communication Drills represent Level 2 training. This level of training would also be process-oriented, training basic communication skills. It would do so, however, within the context of a longer tactical scenario, where a broader range of communication skills would be practiced repeatedly. Thus, it would be more akin than the Level 1 Basic Communication Drills to "whole-task training." Level 2 Communication Drills could be used as entry-level, diagnostic training, allowing commanders to determine where weaknesses lie. For instance, after implementing a Level 2 Communication Drill, a commander may decide that one or more members of his team require remedial practice on selected communication skills. In this case, the commander could schedule Level 1 Basic Communication Drills for those team members. Alternatively, he may determine that his unit is ready to take the next step and conduct training that addresses the application of basic communication skills in specific task settings.

Applied Communication Drills represent Level 3 training and would look much like Level 2 Communication Drills in their structure and implementation. However, in the applied drills, the base set of communication skills would represent a secondary focus. The real target of the applied drills is the application and transfer of basic skills, as well as practice on additional communication skills that occur uniquely in certain task settings (e.g., collaborative planning, developing the situation out of contact).

Scalability is achieved by allowing leaders from all echelons within a unit to train on the same objective and mission. The approach specifies that drill sets contain three separate drills, each drill for a different echelon combination (i.e., brigade-battalion, battalion-company, and company-platoon). All three drills use the same training objective, nested within the same division-level tactical scenario and mission, and comprise a single TSP.

To realize the *adaptable* feature, the MEDALIST approach requires each drill to be presented in three different versions, with each version using the same tactical materials, but presenting different tactical events as the scenario unfolds. In addition, each drill contains scripted scenario branches at tactical decision points, allowing the drills to play out differently in different executions. These features allow a training audience to use the drills multiple times to build proficiency.

The MEDALIST approach's integration of these five features in the context of a distributed training setting represents a step forward in meeting Army requirements for functional, accessible training in the area of communication. The approach can be used to hone the skills of proficient battle command teams, or to build communication skills upon the arrival of a new commander or leader. The approach can also be used in institutional training—where students first acquire basic battle command skills—as a means for future leaders to practice the

skills taught in their courses. Furthermore, because the approach is distributed, small groups of Army commanders, leaders, and trainers who are not co-located can train together in a distributed manner. Similarly, participants who *are* co-located can train under realistic, though simulated, dispersed operating conditions (i.e., from different offices or buildings).

Together, the features and benefits of the MEDALIST approach have been demonstrated by a prototype drill and PC-based training system (Graves et al., 2004). The prototype drill is a Level 2 Communication Drill designed for a battalion commander and three company commanders. The scenario/mission setting for the drill is a battalion-level compliance inspection conducted in the context of brigade-level security operations.

The PC-based training system, called the MEDALIST Prototype System (MPS), models the emerging FCS training systems that will support distributed training in the future. The system includes a constructive simulation and a C2 system developed specifically to support an implementation of the prototype drill and exploration of future training system capability requirements. The MPS supports distributed training due to its capability to be run on PCs networked by an intranet or Internet. It creates a training environment that reflects the operating environment by presenting tactical reports from notional higher, adjacent, and subordinate units; common operational picture (COP) displays similar to those generated by the Army's operational C2 system, the FBCB2; and various modes of communication among drill participants for tactical interaction, training control, and coaching.

The prototype drill requires the participation of three support personnel. The primary trainer, called the Observer/Controller (O/C), provides coaching and feedback. An assistant O/C helps the O/C control the tactical scenario and plays the roles of higher and subordinate units and "reach" intelligence sources. Finally, a system operator provides an MPS orientation to the training audience prior to the training and controls the MPS during the training.

Drill execution lasts approximately 2 hours, which entails an approximately even mix of scenario run-time and coaching. The drill begins with the senior commander briefing his intent and scheme of maneuver as he conducts troop-leading procedures. As the drill proceeds, written tactical reports and COP displays are sent to the training audience at predetermined times to portray scenario events. These cues and scripted events cause the commander to interact with his subordinates and reach intelligence sources, revise his situational understanding, and consider revising his intent and scheme of maneuver.

The scenario, though scripted, also incorporates some flexibility through the use of scenario branches. Branches occur at key decision points at which the training audience has to choose whether to change their scheme of maneuver. For each branch, the TSP provides two or more sets of reports and displays that can be selected and used by training support personnel based on the commander's tactical decisions. In one case, the scenario presents events intended to cause the commander to consider changing one of his subordinate unit's avenues of approach. The scenario materials, which anticipate the two avenues of approach that are likely to be used, include two sets of reports and displays. One set presents continuing scenario events and is to be used if no change is made. The other set presents events that would occur if the anticipated change is made.

During development, the prototype drill underwent piloting with military personnel. Selected findings were incorporated into the final version of the drill, as well as into the broader MEDALIST training objectives and approach. Other findings indicated that the extensive scripting required due to the design of the MPS would not allow sufficient freedom to modify tactical scenarios, both in preparation for training and during training. This placed some constraints on training value and the coaching that could be conducted during the pilots. Integration of improved constructive simulation capabilities, however, could serve as a remedy for this condition. Using such capabilities could enable users (especially the training coaches) to modify scenario events more easily and provide training and coaching under conditions more consistent with those needed during future training.

Current Research and Development

The current research focused on developing MEDALIST methods and products tailored for the FCS and SBCT environments. The focus was on designing more functional training, for the present and for the future, with an emphasis on detailing requirements and methods for incorporating performance coaching and performance improvement into training. The goal was to demonstrate the possibility of a distributed training program and, more importantly, to provide a setting for identifying more broadly useful recommendations for the design and development of future training and training systems. Analysis, design, and development focused on revising training system specifications, producing training objectives and drills appropriate for FCS UA and SBCT audiences, and highlighting lessons for the future implementation of the MEDALIST style of training.

Environmental Analysis and Training Design

Identifying impacts of the FCS and SBCT environments on the MEDALIST approach required analysis of what those environments look like. *The United States Army Objective Force Operational and Organizational (O&O) Plan Maneuver Unit of Action* (O&O; DA, 2003) indicates that the emerging operational and training environments will present significant force development challenges, along with concomitant training challenges. Leaders and staffs will require on-demand training available anywhere, anytime, and tailored to their operational requirements. As the operational environment requires distributed command, control, and planning, the training will need not only to address the needed skills, but to do so in an environment that replicates the anticipated operational conditions. Deliberate, time-consuming decision-making will be the exception, not the rule; dynamic replanning with dispersed leaders and battle command on the move will be the norm.

Both today's training and the training for Future Force must provide opportunities for repetitive drills to ensure leaders and staffs attain the highest levels of proficiency. Embedded training capability will be a feature of the FCS, providing leaders and staffs with opportunities that are not only realistic, but also readily available. As units will be geographically distributed, so must the training capability be distributed.

Many of these training capabilities are reserved for the Future Forces and are beyond the reach of current forces and the interim SBCT. The operational requirements, however, are not.

The need for decentralized C2, for distributed planning and replanning, and for adaptive leaders and staffs exists already and will continue to be a challenge. Additionally, training that is focused, efficient, flexible, scalable, and adaptable will remain a goal.

Training Approach and System Design

The MEDALIST training approach, as described earlier, already includes the key features that will be required to address the performance requirements for Future Forces and the SBCT, as well as for the current force. First, the approach contains provisions for repetitive drills. Second, the features that provide scalability and flexibility address the requirement for "tailored" training. Third, the focus on distributed training, combined with embedded training system capabilities, enable the "anytime, anywhere" requirement for leaders and staffs. The flexible nature of MEDALIST also supports implementation in networked-reconfigurable full task trainers, as required in the O&O (DA, 2003). As a result, the training approach itself was deemed suitable for Future Forces and the SBCT as well as for current forces, and the concepts and basic premises were not redesigned or modified for the expanded environment.

The system supporting that training, however, only partially models the requisite capabilities. Distributed training, reflecting both the need for "anytime, anywhere" drills and the nature of the operational environment, was recognized as a significant driver for the MEDALIST approach. The MPS, which was developed to support focused drills, provided the cues and permitted observation and coaching during the drills. For Future Forces and SBCT, a training system will be required with some or all of the same capabilities. Those capabilities already realized in MPS include:

- Voice communication for both tactical information sharing and training support.
- A reporting function for delivering standardized, or formatted, tactical communications.
- An instant messaging function, representing "chat" enabling functions that will be found in future Army C2 systems. The function supports tactical and training support communications.
- A tactical display function that provides the COP, to include the locations of battlefield entities and graphic control measures.
- A tactical overlay function that uses an electronic whiteboard feature and allows the creation of overlays and graphical or visual communication during the training.

Earlier experience with the MPS suggested improvements that could increase its utility and efficiency. With its extensive requirement for the scripting of tactical reports and displays, the MPS did not provide sufficient flexibility in the extent to which tactical scenarios could be modified, either in preparation for training or during training. Therefore, subsequent design focused on exploring the utility of integrating additional simulation capabilities by means of OneSAF Testbed Baseline (OTB) simulation. With such integration, users would be able to modify scenario events more easily, allowing commanders to make more decisions during a drill and train with a more dynamic and realistic COP. The integration was also expected to reduce

the requirement to develop the multiple drill versions that are currently needed to portray varying scenarios, providing training that is truly adaptable to the requirements of different users.

Integrating OTB and MPS, however, led to a staffing modification–the addition of an OTB operator. Although one of the secondary goals of the current MPS design was to minimize support requirements, such integration allowed an examination of the potential for replicating SBCT and Future Force environments. It also supported the documentation of the technical enhancements that would be needed for more efficient use of the OTB.[4]

The MEDALIST Training Manual, which provided comprehensive guidance on the training approach, required only modest structural changes. This manual is designed for users with little or no previous experience executing MEDALIST drills, and is organized as a set of drill version-specific guides that contain participant task overviews, tactical materials, execution materials, training objectives, and guidance on operating the training system. Its major parts include planning and preparation guidance for participants and support personnel, specific drill information, and training system database files for each drill version, containing drill set-up and scenario generation data (e.g., scripted tactical reports, COP displays, and OTB files).

Training Objective and Drill Design

The second area of continued development represented the design of training objectives and drills appropriate for the FCS and SBCT environments. An increased focus on examining the advantages provided by "reach" capabilities also led to incorporating reach requirements into the new drills. Four drills were developed in the form of advanced communications drills, exemplifying that aspect of the MEDALIST framework. While the original MEDALIST drill addressed fairly procedural aspects of communications and information sharing, the new advanced communications drills required more complex cognitive skills.

The overarching task for the drills was "dynamic replanning," and was selected on the basis of two criteria. First, this is a task that is viewed as being an important aspect of Future Force performance. Selecting such a task would make the project more meaningful to its intended audience, the developers of Future Force training. Second, the task contains a significant communication component, making it suitable for the general MEDALIST approach. More specifically, it is suitable for MEDALIST Level 3 training, focusing on communication as it occurs in a specific task setting. This supports the demonstration of a designed but not yet instantiated type of MEDALIST drill.

The term "dynamic re-planning" is not mentioned in the Future Force O&O (DA, 2003), per se, but does appear in a brief on FCS Networked Battle Command. That brief describes

[4] One alternative that was explored was the use of a Java application to link the MPS and the simulation to enable automatic generation of the tactical reports, thus eliminating or minimizing this additional support requirement. This capability would also eliminate or reduce the requirement to script tactical reports during exercise development, leading to a reduction in development time. Actual development of the Java application was, however, beyond the scope of the current research and development. Other enhancements identified as desirable for the SBCT and Future Force training environments included the portrayal of feeds from aerial and ground sensors and representation of reach activity to a home station operations center (HSOC).

dynamic re-planning as a system design tenet that requires an autonomous mission planning assessment capability that can be applied under unique conditions. For example, dynamic re-planning can be applied when a unit encounters such a dramatic change in mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC) that current plans no longer apply. In dynamic replanning, thus, the unit must initiate *new planning* as opposed to issuing a fragmentary order (FRAGO) to execute a contingency plan.

This type of capability for new planning is consistent with the Army's current vision of battle command on the move (BCOTM). The UA O&O (DA, 2003) defines BCOTM as a capability for commanders at various echelons to plan collaboratively while enroute to an objective on dispersed axes. This allows the commander to adapt to emerging conditions more quickly than his adversary. The BCOTM capability is driven by the conditions of the contemporary operating environment – increasingly complex and high tempo operations conducted rapidly over large areas of operations. The UA Maneuver Battle Lab (UAMBL) further describes BCOTM in the FCS Operational Requirements Document (ORD), noting that mobility must be leveraged while, at a minimum, sustaining the technological advantages of a shared COP and situational awareness between command groups and command posts (UAMBL, 2002).

The FCS Battle Command Network supports this type of performance and enables the conduct of reach activities, where commanders can seek additional help from higher headquarters, adjacent units, the HSOCs, or experts from TRADOC Schools and Centers (DA, 2003, p. 4-23). Additionally, the Battle Command Network supports a specific capability within BCOTM called "enroute mission planning and rehearsal (EMPR)," which offers a key advantage for commanders on the move by enabling joint planning, rehearsal, and execution within and between echelons during all operations, and by supporting plan and orders development during the alert phase to allow commanders and their staffs to modify a plan cooperatively while on their way to the area of operations or objective. Further, EMPR demands the rapid synchronization and adaptation of plans and control measures, and direct simultaneous exchanges of information among dispersed commanders and staff cells across echelons of command. This dictates that subordinate commanders have instant access to tactical products during planning, which will allow them to participate in the current military decision-making process (MDMP) in a simultaneous and parallel manner. This type of participation in the MDMP is described as "collaborative planning" (DA, 2003), and it became the skill of emphasis for the new MEDALIST drills.

Collaborative planning is a broad skill within BCOTM that enables the echelons brigade and below to execute a cycle of rapid decision-making from dispersed locations across a broad range of METT-TC conditions, to include those of dynamic re-planning. In doing so, it supports the utilization of intent-centric operations and the conduct of virtual rehearsals and C2 on the move (DA, 2003, p. 5-10). It can occur at the small unit level from anywhere in the battlespace, enabling more immediate understanding of the plan (p. 4-23). According to the O&O, collaborative planning is:

- A digitally supported and enhanced system working together between one or more dispersed participants sharing situational awareness, focused on a common course of action (COA).
- A digital ability to exchange information and "white board" ideas between dispersed participants to develop courses of action that will be implemented immediately without waiting for a written order.
- A capability to develop, war-game, and virtually rehearse a plan, all while the unit is on the way to the objective.
- A capability for commanders and leaders to plan and rehearse the next engagement while enroute to the objective or line of departure, planning and affecting the next battle before it is joined and allowing decisions to be translated directly into action.

The requisite tasks and activities involved in collaborative planning under dynamic replanning conditions were identified through a series of roleplay exercises. The dynamic replanning requirement was cued by means of a tactical scenario, in which the unit is deployed in Azerbaijan, as part of a joint task force ground component under a joint force land component commander, conducting stability operations near a zone of separation between hostile and host nations. The unit's battle space includes open and rolling, urban, and complex terrain with a threat composed of a combination of conventional forces, special purpose forces, and paramilitary or criminal organizations in a noncontiguous environment. The cue to initiate collaborative decision-making for a transition is a quick strike by the hostile nation to seize terrain within the zone of separation with forces immediately available. The command receives a series of orders from its higher headquarters that authorizes combat operations using existing defensive operation plans, and then changes the mission to an attack to exploit an unforeseen tactical opportunity. These new orders render the original defensive plan irrelevant and require the training audience to rapidly plan a new operation under dramatically changing METT-TC conditions.

The tasks and activities identified during this roleplay, along with a set of conditions and standards for execution and a statement of the overall training objective, were formulated as a MEDALIST training objective format (shown in Appendix C). This training objective, along with the base scenario described above, was designed to be broadly useful for the scalable drills (i.e., drills involving participants from different echelons).

The roleplay yielded procedural execution and information requirements; subsequent developmental implementations with military personnel then focused on the performance requirements consistent with the stated focus of MEDALIST Level 3 training—communication-specific skills and activities and performance of the objective in the collaborative operating environment. Four drill implementations were conducted for this developmental purpose—two for Future Force audiences and two for SBCT audiences. The first Future Force drill supported a Unit of Action (UA) Combined Arms Battalion (CAB) Commander with a Reconnaissance Troop Commander, three Mounted Combat System (MCS) Commanders, an Infantry Company Commander, and a Non-Line of Sight (NLOS) Battery Commander. The second Future Force drill supported an MCS Company Commander and three Platoon Leaders. The first SBCT drill

supported a Squadron Commander and three Reconnaissance Troop Commanders and the second drill supported a Troop Commander and three Scout Platoon Leaders.

Observations during the developmental implementations were used to verify and revise definitions of the collaborative and reach communication skills and activities that are required in order to execute the basic steps of the objective. These were refined into coaching points and were organized under a revised set of steps (now referred to as tasks) that represented activities related to planning, collaboration, transitions, and reach. The final version of the training objective for dynamic replanning is shown in Table 1. Several new tasks were formulated, including three linear process tasks (tasks 2, 3, and 4) and four generic tasks that address non-task-specific collaborative planning and reach skills (tasks 1, 5, 6, and 7). The coaching points represented knowledge, skills, techniques, and criteria for performance. In the case of the SBCT drills, the reach task and coaching points were modified slightly, as SBCT units do not have the extensive reach capability proposed for the FCS units.

Observations during the developmental implementations also led to identification of a set of overarching standards for performance. Standards were developed from statements in the O&O (DA, 2003) indicating the purpose and outcomes of effective BCOTM, collaborative planning, and transitions, as well as information relating to situational awareness (SA), situational understanding (SU), and reach requirements. The revised standards cover the range of skills and activities addressed by the coaching points.

Evaluation

Formative evaluation activities were conducted to ensure the quality of the MEDALIST drills and to identify recommendations for future development and research. During drill design and development, initial evaluations targeted all aspects of the MEDALIST approach to include the proposed drill framework, training system models and features, training methods, and training support designs. Subsequent reviews focused on the prototype drill designs, to include the training audiences, training objectives, tactical scenarios, and TSP structures. The drills were then pilot-tested with military personnel. The pilots had a dual focus. First, by focusing on the capability of the training systems to support FCS and SBCT performance requirements, and on the content and design of the re-planning training objective, the pilots served to identify design flaws that could only surface in light of feedback obtained by an audience representative of the intended product's users. Second, the pilots enabled the collection of audience reactions to the products, which assist in gauging the extent to which prospective users may accept and value the products.

Table 1

Training objective for MEDALIST II drills

TRAINING OBJECTIVE	**Higher Commanders communicate during the collaborative planning of transitions.**

Conditions: The unit is operating under dispersed conditions and has established communications and digital connectivity, to include contacts with Army, Joint, Interagency, and Multi-National reach sources. The unit has intelligence summaries, a common operational picture (COP), and a concept of operations that includes contingencies. The unit receives orders that trigger changes of mission and associated mission planning requirements.

Standards: Higher Commanders maintain a shared situational awareness (SA) and attain situational understanding (SU). Higher Commanders develop plans in the time available. Higher Commanders develop plans that can be translated directly into action. Higher Commanders develop plans that impact the next battle before it is joined. Higher Commanders conduct planning without impeding ongoing operations. Higher Commanders exercise reach capabilities to organic and other assets as needed to answer information requirements.

Tasks and Coaching Points (CPs):

Task 1. Higher Commanders collaborate to maintain situational awareness and attain situational understanding.

- **CP 1a.** Higher Commanders assess and share information contained in reports from higher and subordinate elements.
- **CP 1b.** Higher Commanders determine and communicate the relevance and effect of new reports to ongoing and new missions.

Task 2. Higher Commanders access orders.

- **CP 2a.** Higher Commanders recognize and react quickly to the availability of orders
- **CP 2b.** Higher Commanders know procedures for accessing orders.
- **CP 2c.** Higher Commanders follow procedures for the simultaneous review and editing of documents.

Task 3. Higher Commanders initiate the transition process.

- **CP 3a.** Higher Commanders provide instructions for continuance of ongoing operations.
- **CP 3b.** Higher Commanders turn over control of ongoing operations.
- **CP 3c.** Higher Commanders construct a timeline for collaborative planning process.
- **CP 3d.** Higher Commanders distribute reading requirements to accelerate preparation for planning.

Task 4. Higher Commanders conduct collaborative planning in response to new orders.

- **CP 4a.** Higher Commanders share their capabilities and options for accomplishing the new mission.
- **CP 4b.** Higher Commanders collaborate to analyze mission requirements.
- **CP 4c.** Higher Commanders develop and shares critical information requirements with subordinates.
- **CP 4d.** Higher Commanders develop and shares intent and mission statement.
- **CP 4e.** Higher Commanders collaborate to develop, wargame, and complete a concept of operations.
- **CP 4f.** Higher Commanders, through confirmation briefs, demonstrate shared understanding of the concept of operations.

Task 5. Higher Commanders facilitate and enhances collaborative planning.

- **CP 5a.** Higher Commanders directs collaborative planning.
- **CP 5b.** Higher Commanders distribute analysis and development tasks among team members.
- **CP 5c.** Higher Commanders maximize involvement and contributions from all team members.
- **CP 5d.** Higher Commanders conduct collaborative sessions as needed to meet collaboration requirements.
- **CP 5e.** Higher Commanders set and shares objectives for collaboration sessions.
- **CP 5f.** Higher Commanders set and shares display requirements for collaborative sessions.

Task 6. Higher Commanders leverage system collaboration capabilities.

- **CP 6a.** Higher Commanders use capabilities to communicate effectively per the content and audience.
- **CP 6b.** Higher Commanders use capabilities to accelerate the planning process.
- **CP 6c.** Higher Commanders use capabilities to enhance the planning process.

Task 7. Higher Commanders exercise reach capabilities.

- **CP 7a.** Higher Commanders recognize information requirements that necessitate reach access.
- **CP 7b.** Higher Commanders are aware of available reach assets.
- **CP 7c.** Higher Commanders understand reach procedures.
- **CP 7d.** Higher Commanders access reach assets to affect planning within time available.

Three of the four drills developed during the project were piloted.[5] A total of seven pilots were conducted with twenty-six participants. These pilots supported an evaluation of the training systems, to include their capability to support SBCT and Future Force performance requirements and to refine the re-planning training objective. The role of coach was of particular interest during the pilots. For two of the drills, a subject matter expert (SME) intimately familiar with the training approach filled the coach position. This circumstance enabled an evaluation of the approach and drills under conditions that replicated, to the extent possible, the intended training model. During the other pilot, another military SME less familiar with the approach filled the coach position. This condition allowed for a more rigorous evaluation of the coaching guidance as documented in the TSP materials.

The drills are intended for use by Army personnel assigned to SBCT or UA units, participating in their normal operational roles as platoon, company, or battalion leaders with existing command relationships. Future forces would, of course, be familiar with FCS Battle Command Networks, while SBCT participants would be familiar with digital systems such as FBCB2; MEDALIST drills assume such familiarity. The MEDALIST approach also includes a preparation component, permitting participants to enter the drills with some understanding of the procedures and goals of the training.

Structured observation and interview guides supported the collection of feedback from participants. Interviews began with a restatement of the purpose of the pilots, which was to provide a valuable training experience and gather constructive criticism that would lead to improvements in the products and insights into the requirements for designing future training. Interview topics and questions were selected to coincide with observations made during the pilots, to include estimates of the areas in which the specific audiences would best be able to provide helpful feedback. Appendix D provides a structured interview guide used during the pilot of one of the Level 3 Applied Communication Drills.

Following the pilots, observations and feedback led to the revision and finalization of the drills. Pilot findings also supported the development of recommendations related to future training and research. Summaries of the findings and the recommendations emerging from analysis of those findings are presented in the next section.

Results and Recommendations

Army training development must maintain a careful balance between two primary concerns: generating effective solutions for future training and providing sound, but advanced, training that sustains current and near-term readiness levels. Recognizing these requirements, the current MEDALIST effort applied initial MEDALIST methods and products to the FCS UA and SBCT environments in order to provide insights into the development of future training and training systems. The resulting recommendations address the viability of distributed, frequent, and interactive coaching and feedback; the development of future training systems that are capable of meeting the range of future training needs; and the construction of processes for

[5] The only drill not piloted was the Future Force battalion-company drill. This drill had a seven-member training audience and, thus, did not allow an implementation in the six-workstation ARI research laboratory.

conducting training that takes advantage of deliberate practice techniques. The recommendations are summarized in Table 2.

Coaching and Feedback in Distributed Environments

Future embedded training systems will enable distributed training with tailored feedback and coaching, using automated performance measurement capabilities and techniques drawn from intelligent tutoring research. Personal, interactive feedback and coaching, however, will never outlive their utility. This is true especially in training such as MEDALIST, which emphasizes deliberate practice, to include performance coaching as tasks are performed—not just during end-of-exercise after action reviews—in order to improve performance by the time the training has been completed. During pilots (including those conducted during the initial development work, reported in Graves et al., 2004), participant feedback supported both the feasibility and value of this approach, even in a distributed context. Despite the limitations in the degree to which the actual audiences represented the audiences targeted by the training, audience members still responded positively to questions about the effect of the frequent coaching they received. These findings give rise to the first four recommendations.

Recommendation 1	*Future training should emphasize the frequent provision of coaching as performance occurs in order to ensure performance improvement by the completion of the training.*

In the near future, it is probable that the need will exist for a ready supply of expert mentors or coaches to evaluate and coach performance as the training is executed. These coaches would participate in training via distributed systems and have little face-to-face contact with the training participants. In many cases the coaches would use their operational C2 system and its embedded training capability to carry out the training. In other situations, they would use desktop computers or personal digital assistants (PDAs) to log in to the training.

The MEDALIST pilots serve as a demonstration that distributed coaching is feasible. During the pilots, coaches directed training under conditions in which all participants were located in different rooms. This simulated a distributed training environment. While the tendency existed for coaches to want to pull the group together for face-to-face discussions, such discussions were avoided almost entirely. And while no quantitative data was collected, there were indications from the training audience and coaches that the distributed coaching condition resulted in effective training.

Table 2

Summary of project recommendations

Coaching and Feedback in Distributed Environments
1. Future training should emphasize the frequent provision of coaching as performance occurs in order to ensure performance improvement by the completion of the training
2. Future training must be able to depend on trainers who are themselves trained in human performance coaching techniques to provide the critical guidance and feedback.
3. Developers of future training should consider developing and testing techniques for providing performance feedback and coaching in distributed environments.
4. Future training systems should be designed to minimize the familiarization requirements for coaches and other participants.
Specification of Training Audience
5. Training materials for MEDALIST drills or exercises of similar design and intent should include guidance for executing the training even when the full complement of training audience members are not available for the training.
6. For MEDALIST-type drills that include a significant degree of interaction with higher tactical element, the audience should include the training unit's XO or Information Officer, as mandated by unit type and echelon.
Use of Scripted Material in Training
7. Report scripts must present a realistic, continuous flow of information that causes the tactical situation to unfold naturally and comprehensively in order to cue the performance of targeted tasks; but must not detract from the performance of training requirements.
8. Communication training that is highly scripted should maintain its focus by including explicit mission requirements that justify the scripted schemes of maneuver.
Training Systems
9. Training system development should begin with the construction of basic but full capability systems that can be reconfigured easily and quickly to provide the precise capabilities required by various training events.
10. Command and control system emulations should be designed with the architectural portability that enables a seamless interface with available simulations.
11. Training systems should replicate the role of the human in translating simulation data into useful tactical messages that relate the data to the requirements and conditions of the specific mission at hand.
12. Simulation developers must optimize simulation designs so that they present only minimal processing requirements and run simultaneously, and on the same hardware, as the C2 training system components.
13. Training system designers should identify potential situations in which systems may fail and design features and procedures that users can employ to reinitiate the training as quickly as possible.
Labeling
14. To reduce training preparation requirements, training developers should employ the technique of labeling training and training components so that the titles are highly descriptive in indicating the training's focus and methods.
Implementation
15. The MEDALIST approach should be more fully developed to be used in communications training for students in the Armor Officer's Basic Course (AOBC) at Fort Knox, Kentucky.
16. The MEDALIST approach should be more fully developed to be used in communications training for the leaders of the Army's SBCT at Fort Lewis, Washington.

Recommendation 2	*Future training must be able to depend on trainers who are themselves trained in human performance coaching techniques to provide the critical guidance and feedback.*

Related findings address the issue of selection and preparation of coaches. During future training, coaches should be training personnel who are highly motivated and near experts in their fields. Further, coaches may never have met the personnel they are training and may do the majority of the coaching using distributed methods, including via text. Therefore, these coaches should be expert in three critical areas: the content being trained, methods for training Soldiers and units at every point on the proficiency continuum, and techniques for training and facilitating training in the distributed medium (discussed under the third recommendation).

Regarding the content of training, the contemporary operating environment will require that coaches be experts on multiple enemy organizations, fighting doctrines and regions of the world. Included are political, economic, demographic and other non-military elements that must be considered during training. Likewise, the missions and tasks assigned to future forces will span the full spectrum of operations. Staying abreast of this mix of threats, missions, terrain and demographics will challenge even the most conscientious Soldiers. Add to this any requirements to train information processing and communication skills, and the burden will grow heavier yet.

Additionally, coaches will have to be expert at coaching individuals, small leader teams, and units, and will need to understand how coaching techniques should be applied to address Soldiers at various levels of proficiency. This is a difficult issue to solve and it is virtually ignored in today's training approaches except where full-time O/Cs are present. During the MEDALIST pilots, three coaches participated, each of whom had over 25 years of experience with the Army and Army training. Two of the coaches also had over 10 years experience with training research and development (R&D) efforts with ARI, doctrine development with the U.S. Army Armor School, and instructor experience with the Command and General Staff College. The equivalent person in the Army would be a senior Lieutenant Colonel or Colonel. It is safe to say that not every training event will have such an experienced coach—just imagine that on a given day, up to 120 combined arms battalions will be conducting training of some sort and possibly 10 units of action will also be training. Add to this the number of companies and platoons that will need mentoring. Where will the expert coaches come from? Who will coordinate their participation? How will the coaches be trained? There are numerous questions that must be answered before one can readily assume that such expert coaches will be available.

Recommendation 3	*Developers of future training should consider developing and testing techniques for providing performance feedback and coaching in distributed environments.*

The third recommendation pertaining to distributed coaching addresses the coaching skills that will be needed. Coaches should possess expertise in techniques for supporting training in distributed environments, and these techniques cannot be simply assumed to exist. The TSP for MEDALIST training contains a list of such techniques, based on a literature review which suggested that interaction and participation are difficult to maintain in a distributed environment,

where conflict and uncertainty can degrade group rapport quickly (Bing, 2001; Willis, 1992). The list includes techniques such as the following:

- Actively maintain the trust of the training audience by being honest and discreet (Bing, 2001).
- Encourage participation in the coaching process by requesting input from all members of the audience (Bing & Laroche, 2002).
- Pose direct questions and avoid lecture (Willis, 1992).
- Monitor discussions for emerging conflict (Johnson, Berrett, Sumya, Yoon, & LaFleur, 2001).
- Eliminate communication apprehension (Marshall, 2001).
- Understand the strengths and weaknesses of the communication technologies (Dilworth, 1999).
- Use the available technologies, but humanize the coaching by focusing on the participants and not the technologies (Willis, 1992).
- Prepare the audience to deal with technical complications (Willis, 1992).

The list of techniques provided in the MEDALIST approach is not, by any means, polished or complete. Further, it has not been tested thoroughly. However, it can provide a starting point for further research in the area.

Recommendation 4	*Future training systems should be designed to minimize the familiarization requirements for coaches and other participants.*

The final recommendation addressing distributed coaching concerns the training systems that the coaches and other training participants will use. Given the demand for expert training in all types of simulation, and the proliferation of simulation systems, coaches are increasingly required to be familiar with multiple systems. Coaches should have to spend minimal time learning to operate training systems, to include system set up and use. This can be accomplished through the production of intuitively designed desktop or PDA software (such as the MPS, with which participants had little difficulty operating), or by designing training for use with operational systems, which most coaches will already know how to use.

Specification of Training Audience

Several recommendations related to the specific designation of training audience members were identified. Though the recommendations are somewhat generic and applicable across a range of training contexts, they apply most directly to training of the MEDALIST variety. The development of any well-conceived and efficient training depends on the identification of the training audience. Observations during pilot testing of MEDALIST drills led to the development of recommendations that address the flexibility and requirements that surface in the area of specifying training audiences for training of this nature.

Recommendation 5	*Training materials for MEDALIST drills or exercises of similar design and intent should include guidance for executing the training even when the full complement of training audience members are not available for the training.*

The first observation related to training audience specification deals with the hidden, but inherent flexibility in MEDALIST audience requirements. Due to the limited number of participants available for the pilots, the SBCT Troop-Platoon level drill, a drill with an intended audience of four, was conducted with only three audience members. The troop commander and two platoon commanders participated, but not the third platoon leader. During the pilot, observers documented that the drill ran smoothly and provided effective training for the troop's leadership, even with only minimal roleplaying of the third (missing) platoon leader position. One conclusion is that training such as MEDALIST, which focuses primarily on communication, might be somewhat more flexible than other types of training (e.g., maneuver exercises) in its requirement for full audience participation. That is, it appears that the participation of the full complement of audience members is not essential for any given execution of a drill. Further, it amplifies any statements of the overall utility of MEDALIST drills, in that the drills can be executed effectively and to the benefit of those audience members present, even in the absence of one or possibly more of the audience members. However, to realize this benefit, training developers must be aware of the capability and develop training materials that support and even promote this degree of flexibility.

It will not always be appropriate to allow drills to be conducted with a reduced audience. For example, if the drill referenced earlier had included the Sensor Troop Commander as an audience member and a significant requirement for the use of sensors in the training objective, the absence of that player may have been more difficult to overcome, though it still could have been roleplayed effectively. For drills that can support this type of flexibility, guidance in the TSP should inform prospective users, in clear terms, that the training can be conducted under such conditions. Guidance should also describe procedures for conducting the training effectively under the condition. Procedures should cover the trainer's explanation to the training audience of how the training will be conducted without the full complement of audience members and the tasks required to roleplay missing audience members. During the current project, guidance to this effect was added to the existing prototype drill TSP materials.

Recommendation 6	*For MEDALIST-type drills that include a significant degree of interaction with higher tactical elements, the audience should include the training unit's XO or Information Officer, as mandated by unit type and echelon.*

The second observation relates to the composition of MEDALIST audiences, and a specific requirement that surfaced in this area. During one of the pilots, one of the senior commanders reported being reluctant to initiate collaborative communications that would require his attention for significant periods of time. He stated that his reluctance resulted from a fear of falling behind in the processing of reports received from higher. Similarly, other commanders reported not being able to keep up with report processing demands during the training. This occurred even given efforts to ensure that the incidence of incoming reports would not exceed the commanders' processing abilities. To address this issue, which has the potential to constrain

profoundly an audience's ability to practice and achieve training objectives, training audiences should be supplemented to provide a more realistic and functional representation of operational conditions.

This is especially true in training that generates intense performance requirements, such as those introduced by the planning of one mission during the execution of another, or the execution of missions under Future Force conditions that increase greatly the amount of information to be handled. Further, the benefit of this addition is not limited to maintaining the primary focus of the training. It also produces a more accurate representation of operational conditions, allows a more realistic instance of task performance, and enables users to train an expanded audience, possibly even by taking advantage of the distributed nature of the training.

In revising the MEDALIST prototype drills, it was determined that the audiences should also include an XO for the SBCT Squadron-Troop drill, an XO for the SBCT Troop-Platoon drill, an Information Officer for the UA CAB-Company drill, and an XO for the UA Company-Platoon drill. The drills do not necessarily require these additional participants, but their addition may enable users to attain maximum benefit from the time they devote to the training.

Use of Scripted Material in Training

The MEDALIST approach currently relies on detailed scenario scripts in order to generate and maintain the focus on communication. The scripting is effected by means of prepared operation orders (OPORD), intelligence summaries (INTSUM), tactical reports, and COP displays that are presented according to a prescribed timeline during the drills. While Army personnel commonly accept OPORDs and INTSUMs as necessary training support materials, the use of prepared reports and displays represents a less common and more cumbersome method of scripting. It is likely that their use during implementation of MEDALIST drills would meet with some degree of resistance. However, in the absence of a simulation that provides adequate performance cues while requiring only nominal roleplayer support, detailed scripting of reports and displays will be required.

Scripting is used to create realistic training environments. Realism is achieved by having reports that reflect the incidence, content, and detail seen in real reports, as well as displays that provide a representative amount of the detail and interactivity provided by the Army's operational COP displays. Scripting also provides cues for the performance of targeted tasks, and serves as an element of the scenarios that maintain the focus of training by controlling or channeling an audience's scheme of maneuver.

Because of these essential characteristics, the overall process of developing a MEDALIST scenario and drill is a complex endeavor. The traditional method of utilizing constructive simulation to generate a dynamic training environment presents its own encumbrances. Consider, for example, the large number of personnel needed to run exercises that use the available constructive simulations. In fact, the number is unacceptably high for small group training. Another method—on-the-fly scripting—would accommodate more freedom of maneuver and produce a more flexible drill, but would also quickly exhaust and

overwhelm a drill controller; further, it would not *necessarily* reduce the scripting required during drill development.

Thus, given the essential role that scripted materials play in small group training, observations related to the audience perception of realism, comprehensiveness, and sufficiency of MEDALIST scripted materials were analyzed to generate the following two recommendations.

Recommendation 7	*Report scripts must present a realistic, continuous flow of information that causes the tactical situation to unfold naturally and comprehensively in order to cue the performance of targeted tasks; but must not detract from the performance of training requirements.*

Participant feedback from the implementations indicated that the scripted reports provided during the drills were disjointed, or sparse, and failed to provide timely and adequate cues for upcoming events. Additionally, observers noted that the report script of the Level 2 Company-Platoon Communication Drill did not contain sufficient extraneous information to cause participants to identify information relevant to the senior commander's development of a complete and accurate COP.

The conclusion is that developers must generate report scripts in the detail needed, not only to present tactical events, but also to describe those events consistent with the flow of information that would result if the reports had originated from troops on the ground. Doing so would result in the portrayal of a realistic training environment that provides an adequate amount of information and realistic notice of upcoming events, which serve as cues for task performance. That being said, a fine line exists between meeting this criterion and maintaining a manageable report load that allows the freedom, or time, for participants to focus their energy on the targeted training requirements. Because MEDALIST drills provide limited visual cues, written reports represent the primary manner of providing information to the training audience. Providing too much information too quickly, however, overwhelms participants and distracts them from the task at hand.

Prior to conduct of the pilots, the prototype drills were refined by adding reports that would cue participants more thoroughly to key upcoming events (e.g., presentation of a FRAGO, arrival at a key checkpoint, terrain feature, or town), but not to the less consequential aspects of the scenario. Further, information that was not truly salient to the development of an accurate, meaningful COP was added to selected reports. These solutions represent feasible methods for promoting realism and focus in MEDALIST drills and other training that employs significant report scripting.

Recommendation 8	*Communication training that is highly scripted should maintain its focus by including explicit mission requirements that justify the scripted schemes of maneuver.*

Other feedback and observations related to scripting dealt with the provision of the scripted information that channels audience maneuver decisions in directions supported by the

prepared scenario branches. During one pilot of the Level 2 Communication Drill, participants commented that they would have chosen a vastly different scheme of maneuver. They preferred the alternate course because it would have accelerated their advance toward the objective. Their chosen course, however, would have rendered useless all the scripting and, thus, preempted performance opportunities built into the drill. Based on the principle that multiple effective methods for designing missions generally exist, the need exists to provide scripts that thoroughly justify the course built into the scenario.

Participants who provided the feedback described above were captains functioning in the role of platoon leader. Their comments, thus, can be explained to some degree by the finding from the initial project that suggests that senior level commanders, more than their subordinates (i.e., lieutenants), desire greater freedom to control their units (Graves et al., 2004). It is not out of the question, however, that less senior officers would occasionally demonstrate the same behavior. If this is the case, providing the conditions needed to justify the scripted plans should reduce the potential for audiences to grow uncomfortable with their assigned courses of action and schemes of maneuver. In turn, audiences should be more likely to focus on training requirements, such as communication, rather than on maneuver.

During the research, the previous recommendation was applied by revising the Level 2 Company-Platoon Communication Drill. The initial version of the drill required the unit to execute a company wedge formation and send one of its platoons into a town. The script, however, provided no justification for executing the mission in this manner, other than the order to do so. The script was revised to provide a rationale for entering the town by adding commander's critical information requirements (CCIR) to the OPORD extract. The CCIR requires the platoon to attempt to enter the town in order to gauge the mood and beliefs of the citizens regarding a recent assassination attempt of a town leader. The platoon's findings are to help the commander decide how the unit should approach its final objective. Based on participant comments, this action was effective in maintaining a realistic tactical context for the drill activities.

Training Systems

The Army's stated need for training conducted before, during, and after deployment represents a key determinant of training system requirements. Training systems may be platform- or network-embedded, but should also be provided in versions that can be used in office, motor pool, or travel environments, or wherever Soldiers find themselves. This will help to reduce wear on the platforms and support the increasing need for distributed training. In the meantime, the Army will need interim systems to satisfy near-term training needs and provide models for future systems. The recommendations provided in this section deal with the design of both interim and future systems.

The current project produced prototype training systems capable of supporting the MEDALIST drills. The systems utilized the MPS and the OTB, and pilot findings indicated that the system designs provided the basic tools necessary to support the training. This does not mean that the system designs could necessarily be employed outside the context of the ARI lab, as the systems require hardware and software not commonly available at Army installations. It

does mean, however, that the designs represent effective prototypes for future system designs. Thus, the prototype designs provided a "laboratory" for identifying recommendations on the design of future and interim training systems, which will comprise operational C2 systems, emulations of those systems, and simulation drivers (e.g., OTB). The recommendations identify requirements for providing the features, architectural portability, and troubleshooting capabilities needed to support system application in the context of future training.

Recommendation 9	*Training system development should begin with the construction of basic but full capability systems that can be reconfigured easily and quickly to provide the precise capabilities required by various training events.*

Revisions of the MEDALIST approach for the SBCT and Future Force operating environments included identification of the basic features that training systems would need in order to support training in those environments. Available systems were then modified to generate three training system models that would support the project's prototype drills. The models included an MPS-only model for the current force drill, an MPS-OTB model for the SBCT drills, and an MPS-OTB model for the UA drills. Together, the models offer a variety of current and future features for supporting training in the current and future operating environments. The most basic features of these models include capabilities for sending written tactical reports, communicating by voice, presenting tactical COP displays, and communicating via an electronic whiteboard function. Other features provided include instant messaging and access to notional unit web sites that provide tactical products associated with current unit operations. Features not incorporated due to software constraints, but estimated to be important for future operations, include: access to sensor feeds; real-time, easily displayed logistics pictures; and reach access to personnel and web sites at unit HSOCs and other Army, Joint, Interagency, and Multi-National organizations.

In all, the features described above appear to represent the key features implied or specified in the O&O (DA, 2003). They will be required to support the training of the range of future C2 tasks and, therefore, should be included in the Army's current and future training systems. Feedback from MEDALIST participants, however, indicated that Soldiers are not interested in training with features not currently supported by their operational systems or that they do not expect to use in the near future. Thus, the complexity of the Army's requirement to develop training systems will reside in designing systems that provide the exact features required by different users. To the extent that training employs platform-based operational C2 systems, this requirement has little effect on the system design process. However, in the design of system emulations, the requirement takes on great significance.

To address this requirement, a single base C2 system—the MPS—that provided as many features as possible was developed. Modifications to the system permitted presentation of the different versions of the system needed for the different drills, or training audiences, with each version providing a different set of features. This approach, with its effectiveness demonstrated during the project, appears to represent a model that should be used in future system design and development.

A design approach that incorporates this type of reconfigurable training support is consistent with the FCS tenet that requires the design of flexible, multi-purpose systems that support the range of Army training needs. Further, implementing such an approach should increase the utility of the Army's investments in training system development.

Recommendation 10	*Command and control system emulations should be designed with the architectural portability that enables a seamless interface with available simulations.*

This recommendation focuses on designing simulations and C2 systems that will run and operate together, seamlessly, to minimize the degree to which human participation is required to provide effective training support. The MEDALIST project began under the assumption that ARI would rewrite the MPS, originally written in Visual Basic, in Java code. Rewriting the software would allow the MPS to run on a wider variety of platforms, to include machines running the Linux operating system. It would also allow the MPS to communicate directly with the OTB simulation software which also runs on Linux platforms. Time and resource constraints, however, prevented completion of this task and the rewrite of the software did not occur in time to be used for this research effort. While this did not impede the achievement of the project objectives of developing working systems and identifying recommendations for future training system and training development, it did complicate the task of developing a consolidated C2 simulation system in support of drill implementation.

We also began with the assumption that the hardware available in ARI's lab would provide the processing power needed to run the OTB software in support of the prototype drill scenarios. The OTB's documentation (U.S. Army Program Executive Office for Simulation, Training, and Instrumentation, 2004) specifies that the system can operate with an entity count not exceeding one thousand. During development, however, it was noted that the computers, even though they represented state-of-the-art machines with dual 2.6 gigaHertz (gHz) processors and 2 gigabytes (GB) of random access memory, could not support an entity count this high. The solution to this problem required the use of two Semi-Automated Forces (SAF) "Farm" workstations—one which controlled the friendly forces and one which controlled the enemy forces—and four secondary workstations. The training audience used the secondary workstations which were configured so that they did not provide the capability to control force entities. This reduced the processing demands on these workstations. Further, the entity count was reduced to approximately 280 enemy and 600 friendly entities. This allowed the drills to show a near-full status of the units directly involved in the drills, while consolidating the entities of units of only more peripheral involvement. Using two Farm workstations also enabled the four secondary workstations to share two persistent object databases, reducing the processing load on the secondary workstations.

Architectural portability of training systems—that is, the capacity for the software to be used in all of the systems without redesign—is a planned feature of the FCS and should be achieved in time. It is an immediate requirement, however, for interim training systems. These systems must communicate with each other in a way that increases training efficiency. Command and control systems and simulations must share data that enable the presentation of performance cues to the training audience. This type of communication permits the transference

of COP information (e.g., unit location and status) into formatted tactical reports that portray that information. Further, the provision of these cues, or reports, should be made possible with only minimal requirements for roleplayer personnel who aid in the translation.

Recommendation 11	*Training systems should replicate the role of the human in translating simulation data into useful tactical messages that relate the data to the requirements and conditions of the specific mission at hand.*

Interoperability also demands that training systems communicate with each other in order to represent the training environment as completely and efficiently as possible. The functional aspect of linkage between systems reduces, to a great extent, requirements for training support personnel (i.e., roleplayer) and pre-exercise report scripting. However, it is not enough for a simulation to drive a multi-faceted presentation of a dynamic, real-time COP, even if the information provided to the training audience includes all the details associated with unit/vehicle status, location, and contact events. Furthermore, it is not enough that the system translates simulation data into reports formatted to Army specifications, a function currently supported only in prototype form. While both capabilities enable the presentation of information to training audiences in a usable form, that form may not be ultimately useful. That is, the capabilities may not relate hard data to the context of a specific mission situation and, thus would require roleplayer expertise to perform this task. For example, a report from a subordinate unit might indicate that contact has been made with an enemy vehicle at a given time and location; it may even provide an estimate of the enemy's type and condition. It may not provide, however, any information relating to the assessment of the notional subordinate commander's assessment of how that contact will affect mission accomplishment, reflecting situational understanding or projection.

This element of reporting is critical, especially under the distributed, decentralized operating conditions of the contemporary operating environment, and must be provided in order to minimize the requirement for roleplayer participation or pre-exercise scripting of the scenario. One solution would entail designing simulations that have the capability to make an analytical calculation, based on highly informed algorithms of force on force and other encounters, of the effect of the specific event (i.e., contact) on the notional unit's course of action. The report, in addition to indicating that contact has occurred, would also indicate that the unit would be unable to proceed with its course of action at that point in time. Given the infinite and ever-changing number of potential situations it would be impossible to anticipate all reporting requirements. It may be more effective to develop algorithms that can make rapid assessments of simulation events and automatically develop appropriate reports. Such algorithms can reduce the requirement for roleplayer expertise and report scripting by automatically developing suitable reports. Achieving this goal in the development of future training systems could be significant in large-scale exercises that would otherwise require numerous roleplayers and complex report scripting.

Recommendation 12	*Simulation developers must optimize simulation designs so that they present only minimal processing requirements and run simultaneously, and on the same hardware, as the C2 training system components.*

Though a high-end system may present the complete operational environment in all of its vast complexity, if Soldiers do not have access to the hardware required to run the systems, the systems have no real value. Further, systems that stress processing capabilities to the maximum will require the training audiences to deal with frequent system slow-down and crashes.

Recommendation 13	*Training system designers should identify potential situations in which systems may fail and design features and procedures that users can employ to reinitiate the training as quickly as possible.*

Even in the event that training systems reduce the potential for system failures, complete reliability cannot ultimately be ensured. Computers do what software tells them to do. Thus, software developers must know what instructions they need to write. In such a complex environment, this is virtually impossible to achieve in full. Add to the equation the errors made by humans who run the systems, and the result is performance that is certain to be somewhat unreliable, even under the best of conditions.

System developers always intend to produce system designs that will decrease the likelihood of system failures, or crashes. However, crashes still occur, even with fielded simulations, some of which include Janus and Simulation Networking (SIMNET) (Hoffman, Graves, Koger, Flynn, & Sever, 1995), Brigade and Below Battle Simulation (BBS) (Graves, Campbell, Deter, & Quinkert, 1997), and Close Combat Tactical Trainer (CCTT) (Flynn, Campbell, Myers, & Burnside, 1998). Given the complexity of the software supporting simulation-based training, system crashes will continue to occur as long as there are systems to be crashed.

In anticipation of these occurrences, developers should include features in the software to facilitate bringing crashed systems back on-line with minimal effect on the drill and drill participants and document the procedures in the TSP. For example, the MPS includes one feature that allows the drill controller to load COP displays manually in the event that the system fails to update all workstations automatically and another feature that allows the controller to save and bring back the instant messages generated during drills. Additionally, there are procedures for restarting the OTB SAF Farm workstations in minimal time so that members of the training audience would not notice that the system had ever "gone down." All procedures such as these were distributed to pilot support staff and served their purpose during the pilots. Because of the frequency and inevitability of system crashes, features and procedures such as these should be included in the development of future training systems.

These features and procedures should minimize any negative effects on the training experience by enabling the regeneration of the simulated environment so that it provides the complete and precise tactical circumstances that existed at the time of the failure. System users should not have to define such procedures after the fielding of systems. They should be free to concentrate their efforts on *leveraging* training system capabilities, rather than on compensating for the lack of capabilities.

Leveraging the "Labeling" Technique

One additional recommendation on the TSP itself is offered, and this recommendation goes beyond MEDALIST-like training. For more than a decade, ARI's work in the development of structured training has recognized and addressed the need to limit the requirements associated with the preparation for training events. All preparation should be limited, but it is especially important to do so for the training audience, who should have to conduct as little preparation as possible prior to execution of the training. Still, training participants must begin each training event with a clear and accurate understanding of the purpose of and methods employed by the training. For MEDALIST training, the key effectiveness determinants are the degree to which the training targets communication—the training objective—during implementation and the provision of deliberate practice, which entails the repeated performance of task steps and frequent, active performance coaching. Communicating the requirements for a focus on communication, repeated performance, and active coaching, and doing so as efficiently as possible, thus, is the most critical aspect of preparing participants for MEDALIST drills.

Recommendation 14	*To reduce training preparation requirements, training developers should employ the technique of labeling training and training components so that the titles are highly descriptive in indicating the training's focus and methods.*

One frequently overlooked technique for addressing the requirement to familiarize participants with the focus and methods of training is to label training and its components in a strategic manner. The goal of such an action would be no more or no less than to provide informative, concise descriptors of concepts and processes that would otherwise require greater explanation.

During the MEDALIST I project, there were two instances in which labeling turned out to be quite important. The first instance involved the use of the term "exercise" as the title of MEDALIST events. Because pilot participants did not immediately grasp the relevance of repeated practice to desired training outcomes, the term "exercise" was replaced by the term "drill." Additionally, to increase the likelihood that participants would grasp the communication-oriented focus of the training, the terms "basic communication," "communication," and "applied communication" were attached to the name "drill." The training, thus, was labeled with the following titles: "Basic Communication Drills," "Communication Drills," and "Applied Communication Drills."

The second instance involved the use of the terms "O/C" and "Assistant O/C." Following the pilot testing in the initial project, the names of these positions were changed to "coach" and "controller." This change was intended to reduce the connotations of "evaluator" associated with the use of the term "O/C." Instead, the "coaches" would be viewed as facilitators in the process of performance improvement.

Implementation

The final recommendation was identified in response to pilot feedback on the perceived effectiveness and utility of the MEDALIST approach. Overall, participants characterized the

approach as "valuable" and "effective." Specific areas in which participants noted benefits included the following: delivering concise communications, responding to FRAGOs, disseminating information, reporting (in general), prioritizing information, conducting crosstalk, working with shared tactical products, and involving subordinate commanders in the planning process. Furthermore, participant comments indicated that the training would be a good use of time, especially if it is supported by a system that provides more latitude in the area of tactical decision-making. Along these lines, one member commented that he believed his unit would be interested in conducting the training.

This comment, in particular, reinforces similar feedback obtained from recent Armor Officer's Basic Course (AOBC) graduates who piloted the Level 2 Battalion-Company Communication Drill during pilots of the initial MEDALIST prototype drill (Graves et al., 2004). One of those participants suggested that he would like to use the approach in his command; others said the approach should be integrated into the AOBC.

Given these encouraging findings regarding the overall viability of the approach, to include its emphasis on communication and coaching, the approach would likely be accepted and useful.

Recommendation 15	*The MEDALIST approach should be more fully developed to be used in communications training for students in the AOBC at Fort Knox, Kentucky.*

The AOBC could implement the approach by using the Level 2 Company-Platoon Communication Drill, or derivatives thereof. This would require the use of the MPS, or a system of similar capability, but not the OTB. Integrating the MEDALIST approach into the AOBC would have two key benefits. First, it would enable AOBC instructors to supplement current course content with practical training on the very basic skills associated with tactical communication. This is, perhaps, the primary benefit. A close second, however, is that it would provide an opportunity to introduce the training approach to the younger generation of Army officers. These officers, who are not entrenched in traditional Army training, would likely be receptive to new training objectives and methods. During the pilot testing on both projects, the less experienced officers (i.e., recent AOBC graduates) more readily accepted and demonstrated enthusiasm over the MEDALIST approach than did the more experienced officers. This allowed them to focus more readily on the targeted tasks and thus, benefit more from the training. The more experienced officers, alternatively, found it hard to accept the highly scripted nature of the training and the resulting restrictions on the freedom to plan and control their unit's actions. Scripting, however, while currently required to implement the approach, is not a key tenet of the approach; rather, it represents only a method of supporting the focused, deliberate aspects of the training. As future training systems that reduce scripting requirements and enable greater tactical decision-making opportunities become available, the approach would likely be more accepted in a broader context. For now, however, the approach's implementation in the AOBC can prepare future leaders for conducting similar, but better, training in the future.

Though implementing the approach in the AOBC will offer advantages, several issues require attention prior to that implementation. These issues include (a) determining and

designing training system support for the training, (b) modifying available drills to satisfy the conditions under which the training would be conducted, (c) tailoring training support materials based on the implementation method selected, and (d) providing the necessary train-the-trainer training on the use of the approach and drills.

The first issue stems from the fact that AOBC cannot support, with current course resources, training that utilizes the MPS. That is, the classrooms lack the suite of dual-monitor, networked computers needed to run the MPS, and it is unlikely that AOBC will acquire this capability anytime soon. One way to implement the approach, then, would be to gain access to external resources. An endeavor such as this would not be considered a permanent solution. Instead, it would be justified only as an effort to determine if the value of the training is sufficient to justify the course's acquisition of its own support resources.

Implementing the approach, however, is not completely dependent on the use of the MPS. There are alternate methods of training delivery. One method would involve the use of lower-end technology, to include commercial off-the-shelf slide show and e-mail software and hand-held radios. Instant messaging software could also be included, but because current C2 systems do not include the capability, it would not represent a requirement. Additionally, the training design could be changed to allow drills to be run at an individual level without the requirement for computer and software support.

The second issue involves anticipated drill modifications and development. Course conditions may stipulate the modification of the available drills so that they meet the specific training needs of the course. While the Level 2 Communication drills (specifically, the Company-Platoon Drill) could be used, it may also be appropriate to develop Level 1 Basic Communication Drills based on the existing Level 2 Communication Drills. This development may be necessary because it would be easier to set aside time for individual training than for group training. Alternatively, Level 2 Communication Drills could be executed in a class of 8-10 students, with two students at each node, or in two or more implementations.

The course could also benefit from an additional version of the Level 2 Company-Platoon Communication Drill, which would require the schoolhouse to modify the events that occur during the tactical scenario, the scripted reports and displays, and the coaching guide. In developing any new drills, one consideration should be developing drills that the students could take with them as they assume their commands. This would require training system specifications to support implementation of the drills on standard Army computer hardware and software.

The third issue involves the need to revise the TSPs, or training manual and guides, to make them specific to the course's implementation methods. Revisions would include: (a) developing new materials for Level 1 training, if needed; (b) tailoring materials and guidance for new training systems; and (c) incorporating guidance on any limitations that result from new design specifications and implementation conditions, to include removing references to implementation of the training in the unit context.

The fourth issue derives from the need for training instructors on the details of the training approach and drills. Training on the approach should include an orientation that focuses on the overarching purpose of the approach, as well as on the methods of coaching and controlling the training. Training on the drills would involve executing the drills once with a coach who is familiar with the approach and with the course instructors filling the training audience positions. Each instructor would then practice coaching a drill while being coached, himself, by the experienced coach. It is critical that MEDALIST coaches be very familiar with the training objectives and how to coach those objectives, and well as with the drill scenarios and how to control or modify those scenarios.

Recommendation 16	*The MEDALIST approach should be more fully developed to be used in communications training for the leaders of the Army's SBCT at Fort Lewis, Washington.*

Implementing the MEDALIST approach with the SBCT offers benefits similar to those afforded by AOBC implementation. It would provide a potentially valuable means of training critical SBCT leader skills in the area of communication. It would also open the door to introducing the approach and methods used to a different segment of the Army population—namely, a core of established officers who are in position to take the concept to the force sooner than the lieutenants at the AOBC. This could prove valuable to any efforts aimed at integrating the approach into training for the Future Force.

The SBCT could implement the approach by using the Level 3 Applied Communication Drills, two of which train SBCT organizations. These drills require the use of a C2 system and a constructive simulation, such as the OTB. Again, however, the implementation would require the resolution of the same system support, drill and TSP development, and train-the-trainer issues that surfaced in relation to implementing the approach in the AOBC.

Regarding simulation support, the SBCT could implement the approach with the same commercial off-the-shelf software described earlier. This could allow for the provision of training at the company-platoon level, using the existing Level 2 Communication Drill as a starting point. To implement the Level 3 SBCT Applied Communication Drills, however, would require a different setup. The SBCT currently has access to the Army's simulation centers, which provide the legacy simulation, Janus, and the operational C2 system, FBCB2. Further, many of the SBCT's personnel are familiar with the operation of Janus. For those who are not, center personnel are available to train and assist. Using these systems, along with providing access to the unit's operations web site or a directory structure that replicates relevant portions of that site, may provide the basic capabilities needed to conduct the drills. The most difficult aspect of transitioning to these systems would be designing a method for storing scripted report and orders content and presenting that content within the framework of FBCB2. Because the Level 3 Applied Communication Drills rely more on reports from higher echelons than on reports from subordinate units, the drills use vastly fewer reports. Thus, the presentation of reports may not be as demanding as might be expected. Another critical issue would be the capability of the systems to support electronic whiteboard functions needed to support aspects of the training that focus on the use of shared overlays.

Drill and TSP development and modification requirements would also resemble those required for an AOBC implementation, in that developers would need to tailor the existing drills and TSPs for the alternate training systems and conditions. Additionally, the development of new drill versions might be necessary to address specific training requirements. The unit would also require a train-the-trainer effort, similar to that described earlier.

Summary and Conclusion

This report has described the background, method, and findings of ARI's second MEDALIST research project. While highlighting the key elements of analysis and development, the report has focused on the recommendations generated from the work. The recommendations discussed in the previous section derive from a singular intent—to decrease the demands associated with training support as they occur in the following areas: (a) obtaining familiarity with training concepts, (b) employing simulation, and (c) integrating performance coaching in distributed environments. If the implementation of training is difficult such that it exceeds the expected benefits of the training, the potential for utilizing the training and leveraging the training theory and concepts on which the training is based, will seldom be realized.

As the Army continues its transformation to the Future Force, current analyses of that transformation indicate the emergence of certain conditions and requirements. First among these is that distributed training will come to represent a standard method of Army training. Factors driving this condition include the increased dispersion of U.S. forces across the globe and the development of embedded, desktop, and PDA-based training capabilities. Under these conditions, the requirement for distributed training *will* surface; and along with the requirement for distributed training will come the requirement for distributed coaching.

Second, as FCS developers produce new operational systems, the emerging performance requirements associated with the use of these systems will create the need for new types of training. Requirements to train will include system usage skills and more basic human performance skills, which include those relating to communication. Further, these skills should be trained as they will occur in the context of UA task performance as well as in isolation, when more remedial training is needed.

The MEDALIST approach is unique among current training initiatives, in that it has potential utility when paired with the conditions and requirements noted above. In addition to providing techniques for distributed coaching, a method for focusing on communication, and a framework of progressively applied practical exercises, the approach also supports the provision of that training in a deliberate, efficient manner, as it incorporates deliberate practice opportunities along with frequent performance coaching. As Army training developers begin to devise methods for conducting distributed training on emerging performance requirements, the MEDALIST approach provides the one set of concepts and content on which they should build. The method allows for effective training without the burdens imposed by full-scale simulation. Yet, the method can also be used in conjunction with full-scale simulation to insure appropriate performance on the tasks of interest. That is, it takes "adventure training" out of full-scale simulation and provides for repetitive performance on critical tasks.

The results of this research effort have already started to influence the development of future training systems. The results have been transitioned and applied to the development of TSPs for the Future Force by the Future Combat Systems – Training Support Package training developers.

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Appendix A

Acronyms

AOBC	Armor Officer's Basic Course
ARI	U.S. Army Research Institute for the Behavioral and Social Sciences
BBS	Brigade and Below Battle Simulation
BCOTM	Battle Command on the Move
C2	Command and Control
CAB	Combined Arms Battalion
CCIR	Commander's Critical Information Requirement
CCTT	Close Combat Tactical Trainer
COA	Course of Action
COP	Common Operational Picture
CP	Coaching Points
DA	Department of the Army
ECOA	Enemy Courses of Action
EMPR	Enroute Mission Planning and Rehearsal
FBCB2	Force XXI Battle Command for Brigade and Below
FCS	Future Combat System of Systems
FRAGO	Fragmentary Order
GB	Gigabytes
gHz	GigaHertz
HSOC	Home Stations Operations Center
INTSUM	Intelligence Summary
IO	Information Operations
ISR	Intelligence, Surveillance, and Reconnaissance
LTC	Lieutenant Colonel
MCS	Mounted Combat System
MDMP	Military Decision-Making Process
MEDALIST	Multi-Echelon Distributed Army Leaders' Information Support Training
METT-TC	Mission, Enemy, Terrain and Weather, Troops and Support Available, Time Available, and Civil Considerations
MPS	MEDALIST Prototype System
NLOS	Non-Line of Sight

O&O	Operational and Organizational
O/C	Observer/Controller
OneSAF	One Semi-Automated Forces
OPORD	Operation Order
ORD	Operational Requirements Document
OTB	OneSAF Testbed Baseline
PC	Personal Computer
PDA	Personal Digital Assistant
R&D	Research and Development
SA	Situational Awareness
SAF	Semi-Automated Force
SBCT	Stryker Brigade Combat Team
SIMNET	Simulation Networking
SME	Subject Matter Expert
SU	Situational Understanding
TRADOC	U.S. Army Training and Doctrine Command
TSP	Training Support Package
UA	Unit of Action
UAMBL	Unit of Action Maneuver Battle Lab
XO	Executive Officer

Appendix B

Training Objective from the Initial Multi-Echelon Distributed Army Leaders' Information Support Training Project

TRAINING OBJECTIVE	Commanders communicate to exert and facilitate decentralized battle command and control in a dispersed operating environment.

TASK 1. The commander communicates to exert battle command and control.

Conditions: The unit is operating in a dispersed and decentralized command environment. The command has established communications and digital connectivity, and reach sources are available to the commander. Intelligence summaries (INTSUMs), the common operational picture (COP), rules of engagement, and the scheme of maneuver have been provided. Tactical tasks have been assigned to subordinate commanders. The commander receives reports and tactical display updates from subordinate commanders and higher intelligence sources. These reports portray events that may adversely affect execution of the current scheme of maneuver within the commander's intent.

Standards: The commander's communications enable him to exert battle command and control. The commander maintains an accurate situational understanding (SU). The commander ensures each subordinate commander understands his task and purpose within the unit's mission and scheme of maneuver, and his freedom and responsibilities in displaying initiative in the absence of further instructions. The commander controls the situation to ensure mission success.

Task Steps and Coaching Points:

Task Step A. The commander seeks information and assessments from subordinates and intelligence from higher (reach) sources.

- The commander requests all, but only the information needed to fill the gaps in his SU.
- The commander monitors cross talk among his subordinates to fill the gaps in his SU.

Task Step B. The commander provides information and describes his SU, intent, and scheme of maneuver.

- The commander provides the information needed to meet his subordinates' information requirements.
- The commander's descriptions of his SU allow the commander to confirm or clarify his SU.
- The commander describes his SU, intent, and scheme of maneuver so that subordinates can describe them accurately and make decisions and take actions that demonstrate understanding.

Task Step C. The commander directs his subordinates.

- The commander's directives are issued so that subordinates can describe the directives accurately and make decisions and take actions that demonstrate an understanding of the directives.
- The commander allows his subordinates to take initiative, demonstrating trust in those subordinates.

Task Step D. The commander communicates effectively.

- The commander uses the communication methods that are most effective for the content, situation, and other members of the command.
- The commander's communications are clear, concise, and timely.
- The commander requests information using direct or open-ended questions, as appropriate.
- The commander requires the use of standing operating procedures.

Task Step E. The commander maintains open communication within the command.

- The commander establishes himself as an aid, not a threat, to his subordinates.
- The commander monitors communications to identify and resolve conflicts.
- The commander maintains contact with all subordinates to enhance situational awareness (SA) throughout the command.
- The commander encourages his subordinates to request clarification of his SU, intent, scheme of maneuver, and directives.

TRAINING OBJECTIVE	Commanders communicate to exert and facilitate decentralized battle command and control in a dispersed operating environment.

TASK 2. Subordinate commanders communicate to facilitate battle command and control.

Conditions: The unit is operating in a dispersed and decentralized command environment. The command has established communications and digital connectivity, and reach sources are available to the commander. Intelligence summaries, the COP, rules of engagement, and the scheme of maneuver have been provided. Tactical tasks have been assigned to subordinate commanders. Subordinate commanders receive reports and tactical display updates from their notional subordinate units. These reports portray events that may adversely affect execution of the current scheme of maneuver within the commander's intent.

Standards: Subordinate commanders' communications facilitate battle command and control. Requests for information enhance the commander's SU and clarify the commander's intent and guidance. Reports and assessments enhance the SUs of the commander and other subordinate commanders and enable the commander to control the situation to ensure mission success.

Task Steps and Coaching Points:

Task Step A. Subordinate commanders request information and clarification of the commander's intent and guidance, as necessary.

- Commanders request all, but only the information needed, based on gaps in their SU.
- Commanders request clarification to ensure they understand the commander's intent and guidance.

Task Step B. Subordinate commanders assess subordinate unit messages and submit reports with assessments, if applicable, to their commander.

- Commanders provide information and assessments based on the COP and their commander's intent.
- Commanders support their commander's development of an SU at every echelon.
- Commanders identify and provide all relevant information.
- Commanders emphasize key pieces of information.

Task Step C. Subordinate commanders cross talk to exchange information.

- Commanders cross talk to enhance their SUs.
- Commanders monitor cross talk to enhance their SUs.

Task Step D. Subordinate commanders communicate effectively.

- Commanders use the communication methods that are most effective for the content, situation, and other members of the command.
- The commanders' communications are clear, concise, and timely.
- The commanders request information using direct or open-ended questions, as appropriate.
- The commanders follow standing operating procedures.

Appendix C

Initial Version of the Re-planning Training Objective from the Multi-Echelon Distributed Army Leaders' Information Support Training Project

Training Objective: Conduct collaborative planning for a transition.

Conditions: The command is part of a joint task force ground component under a joint force land component commander. The command is conducting stability operations in a zone of separation between a hostile and host nations. The command has intelligence summaries (INTSUMs), common operational picture (COP), and a concept of operations that includes contingencies for violations of the zone of separation. Rules of engagement do not allow combat operations beyond the international boundary. The unit's battle space includes open and rolling, urban, and complex terrain. Urban terrain consists of network and linear patterns with no village larger than 5000 people. The threat is a combination of conventional forces, special purpose forces, and paramilitary or criminal organizations in a noncontiguous environment. The command has established communications and digital connectivity with reach resources available. The command is operating under dispersed conditions.

Standards: Commanders achieve situational awareness (SA) and develop a situational understanding (SU) of projected enemy actions and exploitable tactical opportunities. Commanders conduct planning collaboratively. Commanders develop plans for information operations that utilize organic, higher, joint, and national assets and answer information requirements. Commanders develop additional plans that ensure success at decisive points by: (a) preventing enemy intelligence, surveillance, and reconnaissance (ISR) from identifying the unit's transition to the attack and (b) enabling a transition to the attack that does not impede on-going operations. Subordinate commanders understand their tasks, purpose within the command's mission and scheme of maneuver, and freedom and responsibilities in displaying initiative.

Tasks, Task Steps, and Coaching Points:

Task 1. Conduct a situational awareness assessment and develop situational understanding.

Task Step A. Assess effects from the physical environment, to include weather, terrain, time available, and civilian considerations.

Task Step 1B. Assess current enemy compositions, dispositions, recent activities, and trends.

- Define enemy objective(s) and measures of success or failure.
- Identify feasible enemy courses of action (ECOAs) two levels down to include high-value targets associated with each ECOA.
- Define requirements for defeating or disrupting enemy ISR operations.
- Define what may cause the enemy to select an ECOA, change an ECOA, or execute a sequel (enemy success) or branch (enemy failure).
- Identify when and where the enemy can mass effects and ground combat power.
- Identify locations and times within each ECOA where the enemy becomes decisively committed and loses freedom of action.

Task Step 1C. Assess friendly dispositions, task organization, and mission capabilities.

- Identify the effects of the current (on-going) operation on the follow-on mission.
- Identify the unit's unique contribution to its higher headquarters mission.
- Determine the mission's key event times and the unit's limitations in meeting them.
- Identify decision points or transition points between the on-going and follow-on mission with the capability required to execute.

Training Objective: Conduct collaborative planning for a transition.

Task 1. Conduct a situational awareness assessment and develop situational understanding (continued).

Task Step 1D. Assess friendly and enemy strengths and weaknesses.

- Determine who possesses advantages or superiority.
- Determine how to exploit advantages.
- Consider advantages in the areas of information operations, maneuver, firepower (effects), protection, and leadership.

Task Step 1E. Provide initial guidance and instructions for Information Operations (IO).

- Provide initial commander's critical information requirements (CCIR) based on assessment.
- Provide ISR guidance to answer information requirements.
  - Prioritize ECOAs.
  - Identify information requirements, priorities, latest time information of value, and/or the time required for reconnaissance between on-going operations and the follow-on mission.
  - Identify information gaps and reach requirements.
  - Describe objective and acceptable risk for ISR operations.
  - Define reconnaissance focus and tempo.
- Provide initial effects guidance in shaping the battlefield to make contact under most favorable conditions.

Task Step 1F. Describe movement requirements and timeline to execution.

- Identify movement requirements that support multiple courses of action (COA).
- Identify movement requirements that account for projected threat locations.
- Identify movement requirements that ensure units are in place to support tactical tasks.
- Include a timeline for developing plan.

Task 2. Develop a course of action for the new mission.

Task Step 2A. Update SA to account for results and impacts of ongoing IO.

Task Step 2B. Commander presents his COA and guidance.

- Provide intent that includes decisive point, key tasks, and purpose in relation to higher headquarters mission.
- Include new or revised IO, as necessary, including CCIR, ISR objective with associated reconnaissance focus and tempo, and security operations.
- Include desired effects for shaping operations to include deceptive measures and essential fire support tasks (target, effect, purpose).
- Provide scheme of maneuver for decisive operations.
- Provide decision points (CCIR may be addressed here).
- Provide basic graphic control measures.
- Include priorities for protection and sustainment.
- Identify acceptable tactical risk.
- Identify new or revised command and/or support relationships.
- Enable collaborative wargaming.

Training Objective: Conduct collaborative planning for a transition.

Task 2. Develop a course of action for the new mission (continued).

Task Step 2C. Conduct wargaming to complete the COA.

- Use system wargaming tools.
- Employ action/reaction technique using Event, Belt, or Box method.
- Identify the purpose and synchronization of shaping, decisive, and sustaining operations.
- Identify tactical tasks that accomplish the stated purposes.
- Identify task organization and command and control or support relationships required to accomplish tactical tasks.
- Identify actions at decision points across the operating systems to include changes to tasks, organization, command and control, support relationships.
- Identify control measures.
- Embed subordinate unit combat and combat support tasks.
- Confirm that the COA is suitable, feasible, acceptable, and complete.

Task 3. The commander issues order.

Task Step 3A. Commander issues verbal or written order.

- Order describes mission; intent; changes to IO (if applicable); shaping, decisive, and sustaining operations; tasks to subordinate units; operational timeline (optional).
- Order provides basic graphic control measures to enable subordinate planning.
- Order may be verbal and may include overlay.

Task Step 3B. Subordinate commanders conduct confirmation briefs.

- Demonstrate understanding of the commander's intent two levels up.
- Demonstrate understanding of the CCIR and their relation to decision points.
- Demonstrate understanding of unit tasks and purposes in relation to their higher headquarter's plan.
- Demonstrate understanding of the preparation and execution timeline.

Appendix D

Sample Structured Interview Guide

MEDALIST II Project Structured Interview Guide

Topic 1. Document coaching. *(pilot observers)*

Time and Event	Coaching Performed and Audience Responses

Continue documenting coaching on back of page.

1

Topic 2. Design of the approach.

1. The MEDALIST approach is designed to support training that: (a) represents dispersed operating conditions; (b) provides repeated practice of the training objective (collaborative planning for a transition); and (c) provides frequent, active coaching. It begins with a coaching agreement. Could you comment on the extent to which the different aspects of the approach's design contributed to the training experience? *(structured interview questions)*

- Distributed/dispersed conditions: How well did the drill represent these conditions? Do you believe that training this task under dispersed conditions helped you practice/refine your communication skills?

- Repeated practice: Did the opportunity for repeated practice help you learn the skills trained? From one planning situation to the next, do you believe you improved?

- Coaching: Did the performance coaching help you learn skills? What areas do you feel you improved in?

- Coaching agreement: Did making the coaching agreement contribute significantly to the training experience?

2. Did the absence of a staff or executive officer and other supporting positions detract from the training? What aspects of the planning process were you able to train effectively? *(structured interview questions, pilot observers)*

3. Would it have been helpful to have had more time (perhaps before you arrived) to review the training approach, training objective, or initial plans? Was the time you had to train on systems sufficient? *(structured interview questions, pilot observers)*

Topic 3. Design of the scenario.

1. Did you desire more contact with your subordinates (e.g., platoon elements)? *(structured interview question)*

2. Describe the intensity level of the training. Was it too quick-paced? *(structured interview questions)*

3. To what extent did you want additional materials or information from battalion or platoon elements? Do you have any comments on orders, overlays, or plans? *(structured interview questions)*

Topic 4. Training objective.

1. Were there any aspects of the training objective that were not clear or that required more detail? *(structured interview question)*

2. What is the value of training this training objective? *(structured interview question)*

3. Do you believe you got practice using the reach function? Did it help prepare you for the digitized dissemination of tactical products? *(structured interview question)*

Topic 5. Training system.

1. How well did the training system enable you to perform the tasks you were to train during the drill? Collaborative planning with overlays? Reports and instant messages? What did you like? (circles, squares, etc...) *(structured interview questions, pilot observers)*

2. What additional features or improvements to existing features are needed to make this an effective training event? Could you share overlays effectively? *(structured interview questions, pilot observers)*

3. Can the task be trained under with the existing features? *(structured interview question, pilot observers)*

Topic 6. Conclusion.

1. What environments would this type of training be appropriate for or useful in? *(structured interview question)*

2. What are your other comments on the training you participated in today? *(structured interview question)*